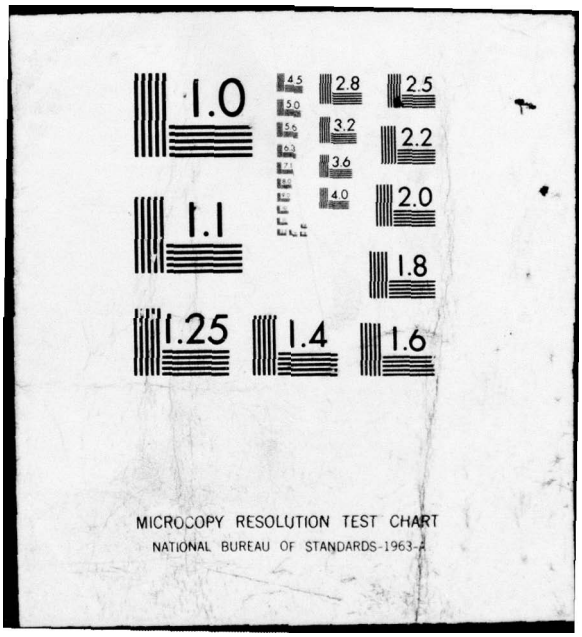
AD-A032 278 ARMY AVIATION TEST BOARD FORT RUCKER ALA F/G 12/1
COMPARATIVE EVALUATION OF LINEAR AND CIRCULAR HELICOPTER PERFOR--ETC(U)
APR 63

UNCLASSIFIED STEBG-AAAB-4D-3510-04 NL

| OF |
AD
A032278

END
DATE FILMED
1-77


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(1)

UNITED STATES ARMY AVIATION BOARD
Fort Rucker, Alabama

(14) STEBG-AAAB-4D-3510-04

(6) 15 APR 1963

SUBJECT: Report of Test, Project No. 4D-3510-04, Comparative Evaluation of Linear and Circular Helicopter Performance and Load Computers.

(11) 5 Apr 63 (12) 11p.

TO: Commanding General
US Army Test and Evaluation Command
ATTN: AMSTE-BG
Aberdeen Proving Ground, Maryland

1. AUTHORITY.

a. Directive. Letter, SMOSM-GCR, Headquarters, US Army Transportation Materiel Command, 23 November 1962, subject: "Aircraft Performance and Load Computers - Request for Comparative Evaluation."

b. Purpose. To conduct a comparative evaluation of a linear type and a circular type Helicopter Performance and Load Computer.

2. REFERENCES. A list of references is attached as inclosure 1.

3. BACKGROUND.

a. The need for helicopter performance and load computers was first established by Combat Development Objectives Guide (CDOG), paragraph 939d(1) CL, 1 April 1960 (reference 1), which stated, "a small manual computer for determining the suitability of various loads for all types of aircraft. This computer will be used by staff officers engaged in planning resupply operations." This paragraph has since been withdrawn from CDOG. Reference 2 requested Office, Chief of Transportation, to furnish information on which to base a reply on the subject of "Factors Affecting Cargo Helicopter Load-Carrying Capability." Reference 3 recommended the development of a "Loading and Performance

Incl 25

Computer." The Chief of Transportation recommended that a slide rule computer and aerology kit be fabricated for service testing and this recommendation was approved by the Office, Chief of Research and Development (OCRD) on 9 March 1961.

ABSTRACT

b. On 25 April 1961, a conference attended by representatives from the US Army Transportation Intelligence Agency Field Office (USATIA) and the US Army Aviation Board (USAAVNBD) was held to discuss general characteristics for a Helicopter Performance and Load Computer. This conference decided on a general configuration of a double-linear, slide-rule type approximately 12 inches long by 2 inches wide. A contract was let by USATIA ~~to the Weir Development Company, Dayton, Ohio,~~ for the manufacture of prototype computers and aerology kit to be provided for evaluation. These prototype computers were evaluated by this Board in temperate and desert conditions during July 1961. Results of this test were reported in Report of Test, Project No. AVN 1862 (reference 4). Conclusions of this report stated that the computers in their present configuration were not suitable for Army use but that they offered sufficient potential to warrant further Army interest. Recommendations were that after corrections of deficiencies and shortcomings were made, that "improved prototype" computers be provided for check test. This action was taken and the improved computers were received for test October 1962. Testing was completed in March 1963. The linear computers were found to be satisfactory provided the few remaining deficiencies were corrected, and type classification as Standard A was recommended (reference 8).

c. Concurrently with evaluation of the linear computers in February 1962, representatives of the Department of Rotary-Wing Training, US Army Aviation School, expressed a preference for a computer with a circular configuration similar to the more familiar standard navigational computer. Such a computer was designed and manufactured by Felsenthal Instruments Company. Circular computers for the HU-1B (UH-1B) and H-21C (CH-21C) were provided by the Felsenthal Company to this Board for evaluation in June 1962. These computers were evaluated in July 1962 in temperate and desert conditions in the same manner as were the linear computers. Reference 5 requested that the USAAVNBD perform a comparative evaluation of the two types of computers.

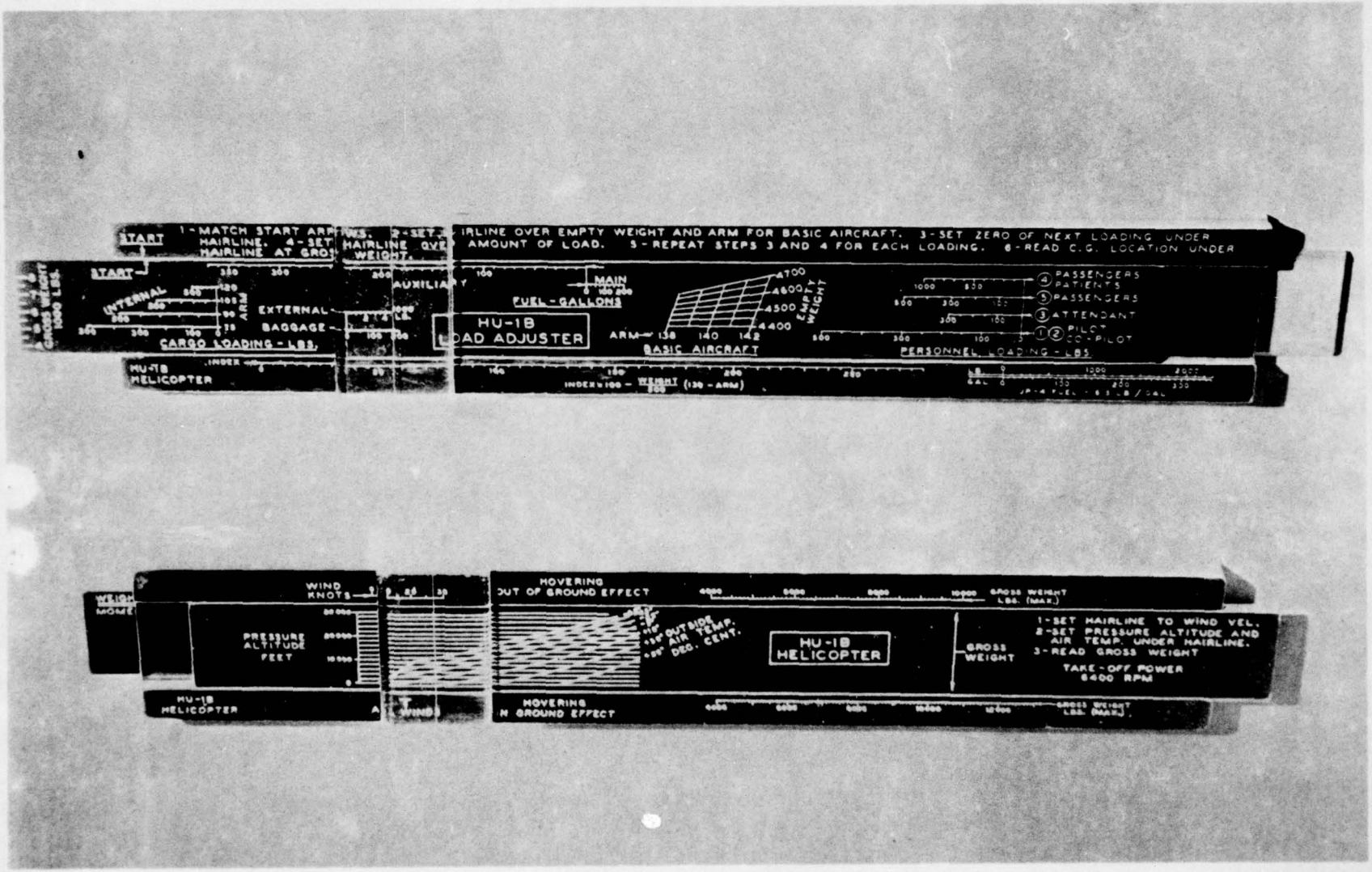


Figure 1. View of both sides of the linear computer

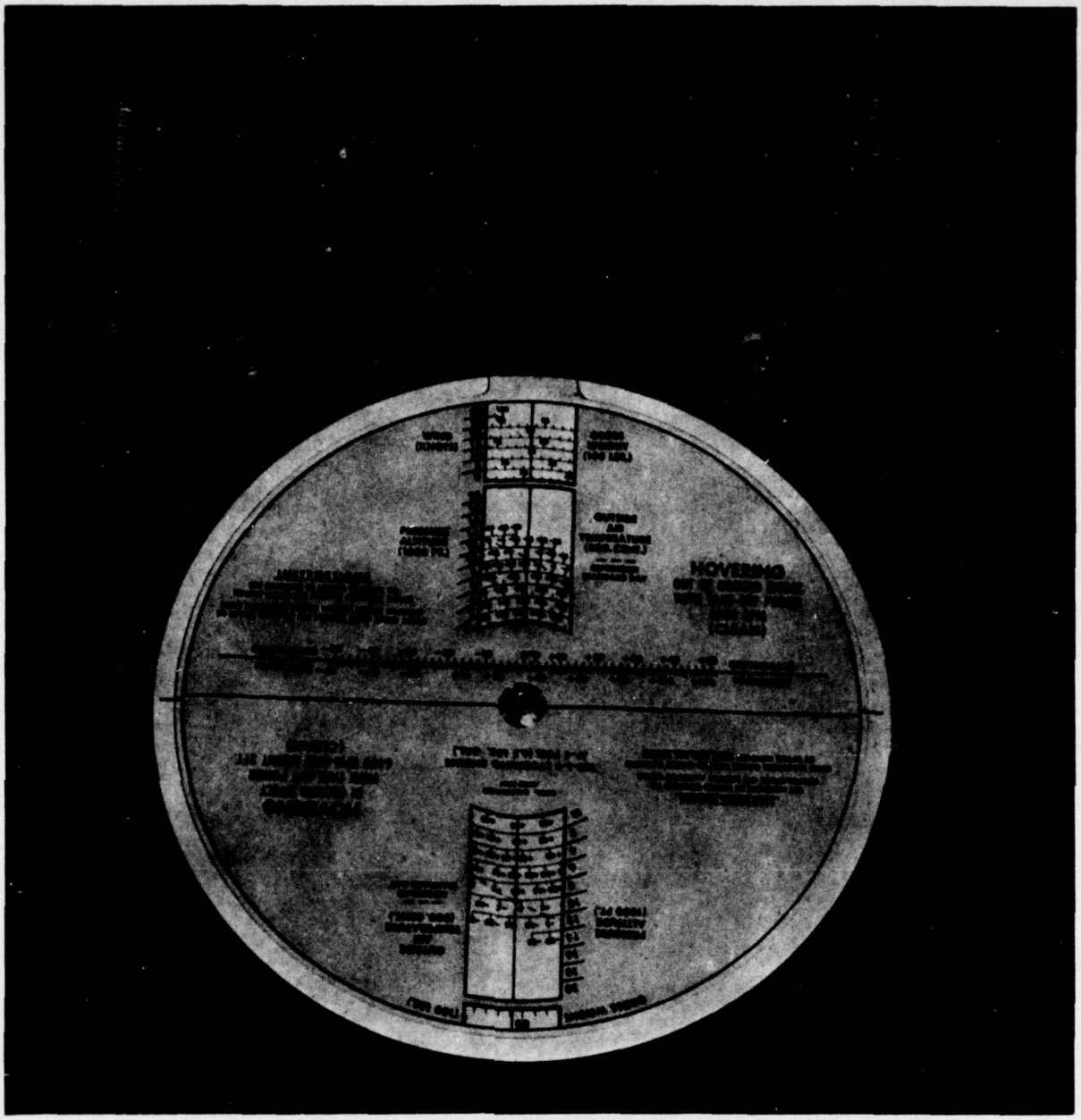


Figure 2. View of the side of the circular computer used to calculate hovering in or out of ground effect.

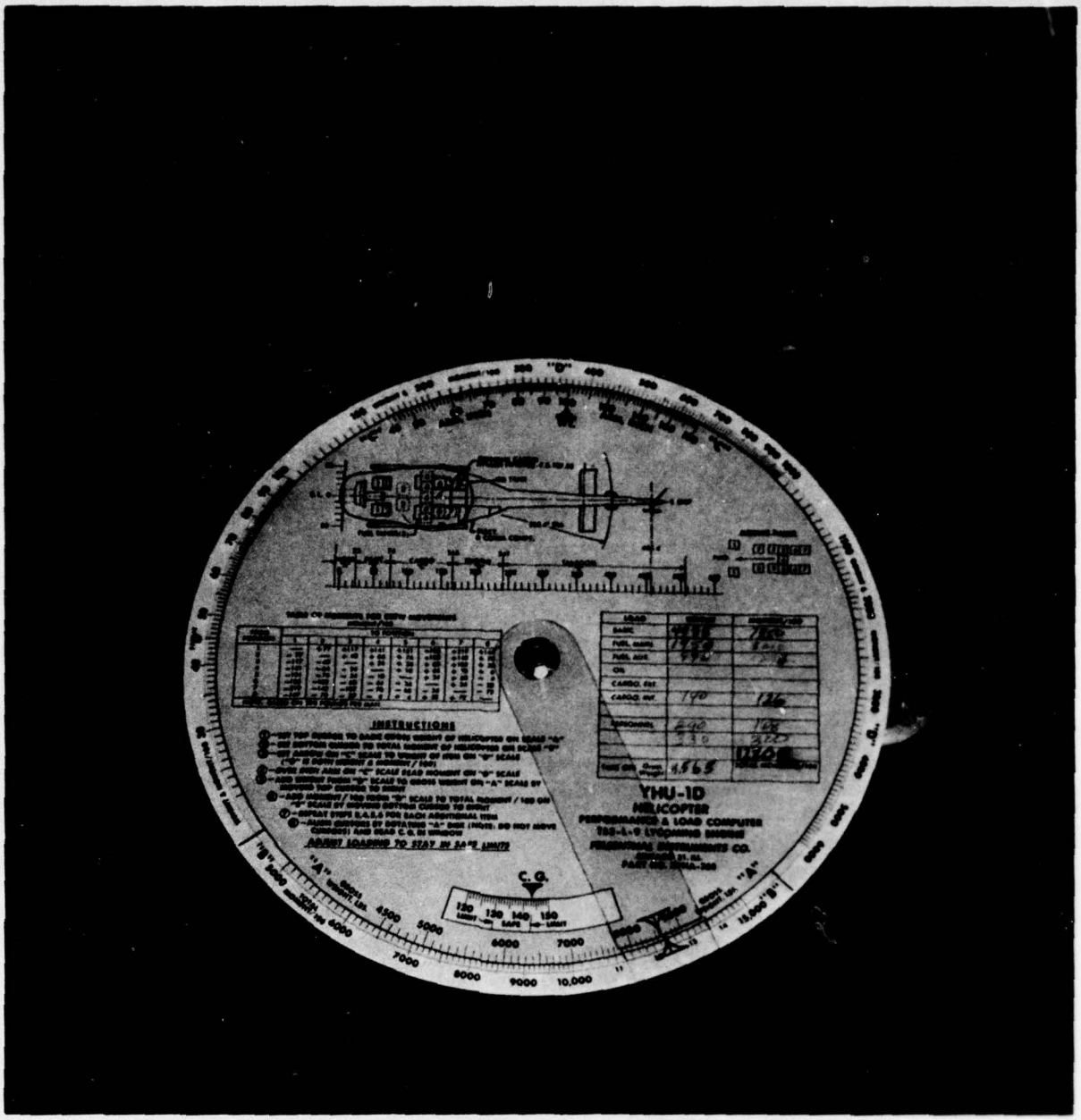


Figure 3. View of the side of the circular computer used to determine center-of-gravity location.

4. DESCRIPTION OF MATERIEL.

a. The linear computer is a slide-rule type of device with two operating sides. One side is used to compute the center-of-gravity location and the other to determine the maximum gross weight allowable to hover in or out of ground effect under various atmospheric conditions. Each side of the computer has a slide which may be removed, turned over, and reinserted to obtain the information on that side. Information is presented in the form of scales, charts, and graphs. A transparent cursor with hairline assists in reading. The information on the computer is derived from data appearing in the appropriate aircraft technical publications. Brief step-by-step instructions for use are presented on the computer. In addition, separate instruction pamphlets containing more detailed operating instructions are provided. The computer is constructed of an aluminum alloy, is contained in a leather carrying case, and weighs approximately 0.9 pound. One of the linear computers was constructed with black letters on a white background; the rest, with white letters on a black background.

b. The circular computer is constructed in principle similarly to the altitude-airspeed portion of the standard MB4 Navigational Computer. There are three rotating parts and one static part, including two movable cursors, attached with one central rivet. One side of the computer is used to determine the center-of-gravity location and the other to determine hovering performance. Information is presented by scales and tables, and no graphs are used. A roughened writing area on the computer face provides a place where weights and moments may be tabulated. Step-by-step instructions are printed on the computer. The computer is made of plastic, is contained in a vinyl carrying case, weighs approximately .75 pound, and is 8 1/2 inches in diameter. The lettering is black on a white background.

5. TESTS.

a. The two types of computers were examined and compared with regard to the following:

(1) Weight.

(2) Readability, both day and night.

(3) Ease of manipulation with and without gloves.

(4) Ruggedness.

(5) Adequacy of printed instructions.

(6) Accuracy of computations.

(7) Simplicity of operation.

(8) Effect of desert environment.

(9) Effect of low temperature.

(10) Individual preference. In addition to the US Army Aviation Board, the computers were distributed to the following organizations for their comments:

(a) The US Army Aviation School.

(b) The US Army Aviation Combat Developments Agency.

(c) The US Army Board for Aviation Accident Research.

(d) The US Army Concept Team in Vietnam.

b. The linear computer offers advantages over the circular computer in the following respects:

(1) Readability, both day and night.

(2) Ease of manipulation with gloves.

(3) Simplicity of operation when calculating center-of-gravity position.

(4) Effect of desert environment.

c. The circular computer offers slight advantages over the linear computer in the following respects:

(1) Weight.

(2) Simplicity of operation when calculating hover performance.

(3) Accuracy when calculating center-of-gravity position.

d. Neither configuration offered any advantage over the other with respect to the following:

(1) Ease of manipulation without gloves.

(2) Ruggedness.

(3) Adequacy of printed instructions.

(4) Accuracy when calculating hover performance.

6. DISCUSSION. Both the linear and the circular computers were considered potentially suitable for Army-use. The linear computer, however, offered more advantages than did the circular computer. In addition, individual preference compiled from participating agencies was predominantly in favor of the linear computer, due particularly to its simplicity of operation and legibility of figures and diagrams. For these reasons the linear configuration was considered to be superior to the circular configuration for an aircraft performance and load computer.

7. CONCLUSION. The linear type configuration is superior to the circular type configuration for a Helicopter Performance and Load Computer.

STEBG-AAAB 4D-3510-04
SUBJECT: Report of Test, Project No. 4D-3510-04, "Comparative Evaluation of Linear and Circular Helicopter Performance and Load Computers"

8. RECOMMENDATION. It is recommended that the linear type Helicopter Performance and Load Computer be considered suitable for further evaluation and consideration for type classification (see Report of Test, Project No. 4D-3510-03).

A. J. RanGin

2 Inclosures
1 as
2 Recommended distribution

A. J. RANKIN
Colonel, Armor
President

LIST OF REFERENCES

1. CDOG paragraph 939d(1) CL, 1 April 1960.

2. OCRD Referral Slip, CRD/H, 17 March 1961, subject: "Factors Affecting Cargo Helicopter Load Carrying Capability (U)."

3. First Indorsement to DCSOPS, BAAR-AR (23 February 1960), USABAAR, 6 February 1961, subject same as paragraph 2 above.

4. Report of Test, Project No. AVN 1862, 2 February 1962, subject: "Evaluation of Helicopter Performance and Load Computers and Aerology Kit."

5. Letter, SMOSM-GCR, Headquarters, US Army Transportation Materiel Command, 23 November 1962, subject: "Aircraft Performance and Load Computers - Request for Comparative Evaluation."

6. Letter, ACTIV-AM, US Army Concept Team in Vietnam, 11 February 1963, subject: "Helicopter Performance and Load Computers."

7. Letter, ACTIV-CHC, US Army Concept Team in Vietnam, 11 March 1963, subject: "Helicopter Performance and Load Computers."

8. Letter, STEBG-AAAB 4D-3510-03, US Army Aviation Board, subject: "Report of Test, Project No. 4D-3510-03, 'Check Test of Helicopter Performance and Load Computers and Aerology Kit.' "

Inclosure 1

UNITED STATES ARMY AVIATION BOARD
Fort Rucker, Alabama

REPORT OF TEST

USATECOM PROJECT NO. 4D-3510-04

COMPARATIVE EVALUATION OF LINEAR AND CIRCULAR HELICOPTER PERFORMANCE AND LOAD COMPUTERS

Recommended Distribution

Agency	No. Copies
CG, USAMOCOM, Centerline, Michigan	3
CG, USASMCOM, ATTN: AMSSM-MR, Washington 25, D. C.	1
CG, XVIII Airborne Corps, Fort Bragg, N. C,	1
Pres, US Army Maintenance Board, Fort Knox, Ky.	1
Pres, USAATB, APO 733, Seattle, Washington	1
Comdt, U. S. Marine Corps, Washington 25, D. C.	1
Comdt, US Army Aviation School, Fort Rucker, Ala.	1
Comdt, US Army Primary Helicopter School, Camp Wolters, Texas.	1
CG, USACDC, Ft. Monroe, Va.	1
CO, USAACDA, Ft. Rucker, Ala.	1
Dir, Marine Corps Landing Development Center, Quantico, Va.	1
British Liaison Officer, USATECOM, c/o Director of Munitions, British Embassy, 3100 Massachusetts Ave., Washington 25, D. C.	6
Canadian Liaison Officer, c/o CG, USAMC, Washington 25, D. C.	5
US Marine Corps Liaison Officer, USAAVNBD	1
British Liaison Officer, USAAVNBD	1
Canadian Liaison Officer, USAAVNBD	1

Encl 2